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Statement on Posiva's operation license application for a spent fuel repository

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Our organisation welcomes the chance to submit comments on Posiva's operation license application for the first spent fuel repository in Finland. We kindly ask you to inform us how our comments will be taken into account.

Copper corrosion

Posiva is planning to use the KBS3-V method for its repository. This method was developed by the Swedish nuclear waste company SKB. Spent fuel will be placed in copper canisters (first barrier) which will be placed in tunnels and backfilled with clay-bentonite (second barrier); the third barrier is the host rock itself. Especially the copper canisters long-term safety is disputed:

The license application documents points out:

"The canister's copper shell protects the unit from corrosion." (p. 70).

"The final disposal canister is the most important release barrier" (p. 100)

"It is very likely that they will contain all the radionuclides inside them for at least a million years." (p. 117)

But: There is an ongoing debate if copper corrosion can damage the containers to such an extent that early leakages of radioactive substances can be the consequence. The Swedish Royal Institute of Technology (KTH) showed that even oxygen-free water can trigger copper corrosion. Much earlier than previously assumed, the copper canisters may corrode in a KBS repository already during the first 1,000 years after closure of the repository. In 2018, these research results lead the Swedish Environmental Court to recommend to the Swedish Government that uncertainties to ensure that the long-term safety of the copper canisters will be resolved before issuing a license for the Swedish spent fuel KBS-repository.

The worrisome corrosion findings were supported by the results of the LOT-project, when it was found out that a copper and clay package stored under repository conditions in the Äspö Hard Rock Laboratory showed corrosion after only 5 years. The investigation of older LOT packages are still disputed as the Swedish SKB did not publish complete data. It is vital that the analysis of the last experimental package that remains in the experiment is entirely scientific, and that the Finnish nuclear regulator STUK works with the Swedish nuclear regulator SSM to ensure this. If the copper corrosion results from that package are scientifically reported and analysed, they can provide important information on the long-term degradation of the copper canister.

Despite the unsolved corrosion issues a license was granted in Sweden in 2022, but is being appealed by Miljöorganisationernas kärnavfallsgranskning (MKG) [Swedish NGO Office for Nuclear Waste Review]. The appeal can be found on MKG's website.

In addition, the barrier of the copper canister and the clay bentonite buffer barrier are not independent of each other. If the copper canister corrodes heavily, the clay buffer will be chemically affected and not swell and be tight to water as assumed in the safety case.

As Finland is also relying on the copper canisters as one of the barriers, we recommend awaiting the Swedish Court decisions, to conduct more independent research on copper corrosion under repository conditions and investigate the LOT results in an open and transparent manner.

For how long will be monitored in the long-term if the copper canister corrode faster than assumed?

An important question was not answered in the documentation provided for the public consultation: The issue of long-term monitoring of the copper canister behavior regarding the issues of corrosion, leakage and other possible changes. Please explain the concept and period of monitoring.

Intrusion into the repository and retrievability of stored spent nuclear fuel

The license application mentions that future generations might want to retrieve the nuclear waste and that retrievability is possible in all project phases:

"It is, however, possible that, in the future, it will become desirable to use a new kind of final disposal method or completely new technology for handling spent fuel, or to utilise or reuse the raw materials or energy stored in the final disposal material." (p. 301)

"[…]the canisters can be retrieved from the disposal repository to the ground surface at all phases of the project. Final disposal will be implemented in phases and, during the operating phase and after the closure of the facilities, each work phase can be reversed." (p. 301)

If future generations want to intrude the repository for one of the above mentioned reasons (or other reasons), they can only do this if the know where the repository is located and where the canisters have been disposed of. But in the license application document does not explain any plans made for the preservation of records, of knowledge and memory.

Posiva assessed the costs for retrieving the spent fuel after the repository's final closure of up to 50% of the costs for constructing, operating and closing the repository. (p. 309) It is highly uncertain if people in the far future will have the means to invest in retrieving these nuclear legacies.

Posiva also assessed the dose for workers who will retrieve the canisters. Due to high doses near the canisters, the staff will be allowed to conduct the retrieval work for a limited working time during the repository's first centuries of operation. (p. 303)

Both, the uncertainties of the future copper corrosion, and the difficult conditions for a possible retrieval of spent fuel from a closed repository are arguments for not closing the repository at all but for subjecting it to a rolling stewardship system of control.

A rolling stewardship system means that once a generation the repository is visited and monitored and that records and knowledge are handed over from generation to generation and are adapted so that future generations are able to understand the information, and that the memory is kept.